



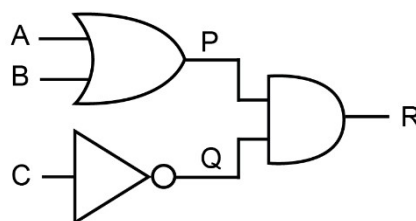
Worksheet 1 Logic Gates and truth tables

Task 1

1. Write the following Boolean expressions using Boolean notation:

- (a) (A AND B) OR NOT (D AND E)
- (b) NOT A AND NOT (B OR C)
- (c) (A AND B) OR (B AND (NOT C))

2. (a) Complete the truth table for the following logic circuit.



(b)

Input A	Input B	Input C	$P = A \vee B$	$Q = \neg C$	Output $R = P \wedge Q$
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			

Write a Boolean expression to represent this circuit in terms of A, B and C, using Boolean notation.

3. Draw logic circuits to represent the following Boolean expressions, and in each case say what is the output if $A = 1$, $B = 0$ and $C = 1$, showing the output from each gate.

(a) $Q = \neg((A \vee B) \wedge C)$

(b) $Q = A \wedge (\neg(B \vee C))$



Task 2

4. Draw the truth tables for the following logic circuits:

(a) $A \vee B$

Input A	Input B	Output Q

(b) $(A \wedge \neg B) \vee (\neg A \wedge B)$

Input A	Input B	$P = A \wedge \neg B$	$Q = \neg A \wedge B$	$Q = A \vee B$

What do you notice about the output in each case?

(c) Draw the logic circuit for the expression: $Q = (A \wedge \neg B) \vee (\neg A \wedge B)$

5. (a) Write the following Boolean expression using Boolean notation:
 $(A \text{ XOR } B) \text{ AND } (\text{NOT } (C \text{ XOR } D))$

(b) Draw the logic diagram using XOR, AND and OR gates, showing the output from each gate if the inputs for A, B, C and D are all 1.